3. COSTS

Total project costs for the OU 5-12 Phase I activities are provided in Table 3-1. These costs include the INEEL management and operations Contractor's project management, materials, and labor costs associated with the remediation of the ARA-02, ARA-16, and ARA-25 sites and the closure of the ARA-07, ARA-08, ARA-13, and ARA-21 sanitary waste systems. An estimated $125,000 is yet to be committed for the treatment and disposal of the ARA-16 sludge waste. An additional $90,432 has been committed for completion of the Phase I activities.

Table 3-1. Remedial design/remedial action costs.

Activity	Cost
Phase I Remedial Design	$ 740,796
Phase I Field Work	$1,761,983
WAG 5 Project Support Activities	$ 462,528
WAG 5 Project Management and Administrative Activities	$ 383,212
ARA-16 Sludge Disposal Costs (Estimated)	$ 125,000
Completion of Phase I Activities (Committed)	$ 90,432
Phase I Remedial Design/Remedial Action Total Cost	$3,563,951

4. MODIFICATIONS TO THE REMEDIAL ACTION WORK PLAN

Modifications to Revision 0 of the Phase I Work Plan were provided in ongoing discussions with the Agencies during the spring of 2001 and documented in Revision 1 to the work plan in June 2001.

4.1 ARA-16 Radionuclide Tank

The primary change to the field activities involved the remediation of the ARA-16 radionuclide tank. This change generated a third option for remediation of the site that placed the ARA-16 tank and contents in a low-risk state by the following:

- Tank contents were removed.

- The liquid was separated from the sludge, filtered to remove organic contaminants, and placed into approved containers. The sludge was dewatered to the extent practicable.

- The disposal facility's acceptance requirements for stabilized liquid were met. For stabilization, the liquid was solidified using a sodium polyacrylate monopolymer and was shipped to the SSA for eventual disposal in the ICDF.

- The dewatered sludge is being temporarily stored in the CERCLA storage unit located at the ARA-I facility until appropriate treatment and disposal can be established.

- The tank, ancillary piping, equipment, and debris were encapsulated in grout and shipped to the SSA for eventual disposal in the ICDF.

These changes were considered insignificant or minor. The stabilized liquid met land disposal restrictions as defined in the numeric treatment standards provided in 40 CFR 268.40 for F-listed waste. Encapsulation and disposal of piping and the tank at the ICDF were not considered changes from the selected remedy. Some decontamination of the piping had been performed and the tank was decontaminated to the extent practicable. Disposal of these wastes at the INEEL rather than an off-Site disposal facility such as Envirocare of Utah was considered an insignificant or a minor change, because the use of an on-Site versus off-Site disposal facility did not significantly alter the scope of the remedy, nor did it alter the performance of the remedy.

4.2 Waste Storage and Disposal

As previously stated, the stabilized liquid and encapsulated waste from the ARA-16 remediation were shipped to the SSA for eventual disposal in the ICDF. In addition, the dewatered sludge is currently in storage in the CERCLA storage unit located at the ARA-I facility. The final disposal of these wastes will be documented in the Phase II Remedial Action Report that will be provided to the Agencies upon completion of the remediation of the WAG 5 soil sites (i.e., ARA-01, ARA-12, and ARA-23). The draft Phase II Remedial Action Report is to be transmitted to the Agencies by January 2006, by which time, these wastes will be disposed. Both the ARA-16 sludge waste and the ARA-02 sludge waste currently in storage will be managed in accordance with INEEL resident procedures and all applicable federal and state regulations. In addition, the status of the waste streams will be documented in the annual institutional control status report.

The disposal of these wastes, of course, is contingent upon the availability of a TSDF that is capable of handling the described wastes. In the interim, the wastes will be stored in compliant facilities and inspected on a weekly basis in accordance with INEEL procedures. The INEEL will work with the Agencies to ensure that the storage of the WAG 5 waste streams is compliant with all regulatory requirements and any long-term storage needs are identified. Also, the INEEL will review and actively pursue alternative disposal options for these wastes.

4.3 Revegetation of Phase I Sites

The reseeding and mulching requirements for the Phase I sites were delineated in Specification 02486, "Revegetation" provided in Appendix B of the Phase I Work Plan (DOE-ID 2001). The specification provided that a grass seed mix consisting of P-27 Siberian wheatgrass, "Ephriam" Crested wheatgrass, and "Sodar" Streambank wheatgrass be applied at a rate of 1.8 kg, 2.3 kg, and 4.1 kg (4 lbs, 5 lbs, and 9 lbs) per acre pure live seed, respectively. Further consultation lead to a modification of the seed mix and application rate per acre as follows:

- Wyoming Big Sagebrush (0.23 kg [0.5 lbs])
- Green Rabbitbrush (0.23 kg [0.5 lbs])
- Indian Rice Grass "Rimrock" (0.9 kg [2 lbs])
- Thickspike Wheatgrass "Bannock" (0.9 kg [2 lbs])
- Streambank Wheatgrass "Sodar" (0.9 kg [2 lbs])
- Bluebunch Wheatgrass "Goldar" (0.9 kg [2 lbs])
- Munro Globemallow (0.45 kg [1 lb])
- Northern Sweetvetch (0.45 kg [1 lb]).

Because of concerns with potential spread of contamination at the ARA-02 site following a snowfall, mulching of this area was not performed. If the site dries out sufficiently to allow mulching without concern for contamination spread, it will be performed at that time.

5. QUANTITIES AND TYPES OF WASTES GENERATED

Waste generated during the Phase I remedial activities was managed per the requirements delineated in Appendix J of the WAG 5 RD/RA Work Plan, Phase I (DOE-ID 2001). Waste Generator Services at the INEEL was responsible for the management of all wastes. This was done per resident procedures at the INEEL.

5.1 Waste Minimization and Segregation

Waste minimization for Phase I activities was achieved primarily through design and planning to maintain efficient operations. To achieve this goal, waste streams were segregated primarily by the field activity being conducted at the time of generation. Waste types generated included conditional industrial wastes, low-level waste, RCRA-hazardous waste, mixed low-level waste, and TSCA-regulated waste. Waste containers were provided for each specific waste stream and were maintained inside the work area until removed for either storage or disposal.

5.2 Packaging and Labeling

Containers for storing hazardous waste met the requirements of 40 CFR 264, Subpart I. Wastes were packaged per the criteria set forth in the reusable property, recyclable materials, and waste acceptance criteria (DOE-ID 1999). The types of containers used included the following:

- 208-L (55-gal) open top drums
- Open-top roll-off containers
- 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) wooden boxes
- 0.6 × 1.2 × 2.4-m (2 × 4 × 8-ft) wooden boxes
- 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) metal boxes
- 76-L (20-gal) open top drums
- Low-level waste packaging (soft-sided packaging).

Bulk waste destined for disposal at the CFA landfill was shipped in a dump truck with water destined for disposal at the CFA Sewage Treatment Plant being shipped in a HIC. The sludge from the ARA-16 tank is stored at the CWSA, located at the ARA-I facility, in a vented HIC. In addition to the ARA-16 tank sludge, other wastes being stored in this area include sludge and debris from the ARA-02 septic system removal action, the activated carbon filter from the ARA-16 remedial action, ARA-16 sample materials, and miscellaneous debris generated during the ARA-16 remedial action. All containers were labeled per resident procedures and in accordance with all applicable state, federal, and local regulations. Table 5-1 summarizes the wastes that were generated during the Phase I remediation activities, including current disposal status.

Table 5-1. WAG 5 Phase I waste summary.

Waste Stream	Volume	Disposal Site	Disposal Status
ARA-02: ARA-I Sanitary Waste System			
Seepage pit sludge	Seven 208-L (55-gal) drums (3,166 lb)	Envirocare	Disposed 12/2000
Debris	Thirteen 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) metal boxes (77,165 lb)	Envirocare	Disposed 12/2000
Debris	Nine 0.6 × 1.2 × 2.4-m (2 × 4 × 8-ft) wood boxes (32,530 lb)	Envirocare	Disposed 12/2000
Debris	One 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) wood box	Envirocare	Shipment planned 02/2002
Debris	Three 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) TX4 boxes (17,860 lb)	Envirocare	Disposed 12/2000
Debris	Three 208-L (55-gal) drums (636 lb)	Envirocare	Disposed 12/2000
Debris	Three 18 yd^3 roll-offs (93,860 lb)	Envirocare	Disposed 12/2000
Debris	One 25 yd^3 roll-off (29,130 lb)	Envirocare	Disposed 12/2000
Debris	One 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) B-25 metal box (410 lb)	Envirocare	Disposed 12/2000
Lead rings	Two 76-L (20-gal) drums (170 lb)	Envirocare	Shipment planned 02/2002
ARA-07: ARA-II Seepage Pit to east (ARA-720A)			
Debris	4.3 m^3 (5.6 yd^3)	CFA Landfill	Disposed 07/2000
ARA-08: ARA-II Seepage Pit to west (ARA-720B)			
Debris	2.3 m^3 (3.0 yd^3)	CFA Landfill	Disposed 07/2000
ARA-13: ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740)			
Septic tank sludge	One soft-sided sack (20,000 lb)	RWMC	Disposed 06/2001
Distribution box sludge	One 208-L (55-gal) drum (350 lb)	Envirocare	Shipment planned 02/2002
Water	21,198 L (5,600 gal)	CFA Sewage Treatment Plant	Disposed 05/2001
Debris	One 12-yd^3 dump truck	CFA Landfill	Disposed 05/2001

Table 5-1. (continued).

Waste Stream	Volume	Disposal Site	Disposal Status
Debris	Two 208-L (55-gal) drums (205 lb)	Envirocare	Shipment planned 02/2002
ARA-16: ARA-I Radionuclide Tank			
Piping	Five 0.6 × 1.2 × 1.8-m (2 × 4 × 6-ft) metal boxes, grouted	Storage at SSA for disposal at ICDF	Shipped to SSA 08/2001 thru 09/2001
Tank	1.4 × 1.4 × 4.0-m (4.5 × 4.5 × 13-ft) concrete monolith	Storage at SSA for disposal at ICDF	Shipment planned 02/2002
Sludge	HIC with 303 L (80 gal) liquid and sludge	ATG	Stored at CERCLA storage unit at ARA-I
Stabilized liquid	Nineteen 208-L (55-gal) drums	Storage at SSA for disposal at ICDF	Shipped to SSA 09/2001
Carbon filter	One 20 × 60-in. unit (6 ft^3 of carbon)	Storage at SSA for disposal at ICDF or off-Site disposal	Stored at CERCLA storage unit at ARA-I
Miscellaneous debris	Nine 0.6 × 1.2 × 1.8-m (2 × 4 × 6-ft) metal boxes, grouted	Storage at SSA for disposal at ICDF	Shipped to SSA 09/2001
Vault and gravel	Two soft-sided sacks (20,000 lb each)	RWMC	Disposed 10/2001
ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2			
Water	3,785 L (1,000 gal)	CFA Sewage Treatment Plant	Disposed 10/2000
ARA-25: ARA-I Soils beneath the ARA-626 Hot Cells			
Debris	Thirty-one soft-sided sacks (20,000 lb each)	RWMC	Disposed 08/2001 thru 09/2001

SSA = Storage and Staging Annex

5.3 Waste Types

Various types of wastes were generated. These included debris (personal protective equipment, plastic sheeting, concrete, concrete piping, pumice/concrete blocks, gravel, wood, etc.), water (both stabilized and direct disposed), sludge, activated carbon, lead, and soil. Other waste forms included unused/unaltered samples, analytical residues, sample containers, residual soils and debris resulting from hydraulic spills and contaminated equipment. The following sections summarize the waste types generated at each site.

5.3.1 ARA-02: ARA-I Sanitary Waste System

Waste generated during the remediation of the ARA-02 sanitary waste system included sludge (bottom cleaning of the seepage pit), concrete and concrete piping (excavation and sizing of system components), three concrete septic tanks, three concrete manholes, pumice blocks (excavation and disposal of the seepage pit), PPE, plastic sheeting, and lead rings from pipe joints. With the exception of one 1.2 × 1.2 × 2.4-m (4 × 4 × 8-ft) box of debris, this waste was disposed at Envirocare of Utah in December 2000 (refer to Appendix F). This remaining box will be shipped to Envirocare for disposal in February 2002. Other waste streams included unused/unaltered samples, analytical residues, and sample containers. The analytical laboratory disposed these "other" waste streams.

5.3.2 ARA-07: ARA-II Seepage Pit to the East (ARA-720A)

Waste generated during the closure of the ARA-07 seepage pit included the roof structure and roofing material, pumice/concrete blocks, PPE, plastic sheeting, and fencing. This waste was disposed at the CFA landfill. No other waste streams were generated during this activity.

5.3.3 ARA-08: ARA-II Seepage Pit to the West (ARA-720B)

Waste generated during the closure of the ARA-08 seepage pit included the three concrete slabs that overlayed the pit. This waste was disposed at the CFA landfill. No other waste streams were generated during this activity.

5.3.4 ARA-13: ARA-III ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740)

Waste generated during the closure of the ARA-13 septic system included the sludges in the septic tank and distribution box, water from the septic tank, concrete debris (tops of the septic tank and the manhole), PPE, and plastic sheeting. The sludge from the septic tank was solidified and disposed at the RWMC. The sludge from the distribution box was solidified and will be shipped to Envirocare of Utah in February 2002 for disposal. Two drums of debris will be disposed at the RWMC in February 2002. The water from the septic tank was disposed at the CFA Sewage Treatment Plant. Concrete debris, PPE, and plastic sheeting were surveyed and disposed as noncontaminated waste at the CFA landfill. Any materials that had come in contact with contaminated sludge were disposed with the corresponding sludge waste stream. Other waste streams included unused/unaltered samples, analytical residues, and sample containers. The analytical laboratory disposed these "other" waste streams.

5.3.5 ARA-16: ARA-I Radionuclide Tank

Waste generated during the remediation of the ARA-16 radionuclide tank included sludge and liquid waste (generated during the cleaning of the tank), tank rinsate (water generated during decontamination and rinsing), concrete (generated from sizing and removal of the vault), gravel (from within the vault), fencing, stainless steel piping, stainless steel tank, PPE, plastic sheeting, and contaminated equipment generated during remediation. The liquid tank waste and rinsate water were stabilized and shipped to the SSA for eventual disposal in the ICDF. The sludge waste from the tank is in a HIC stored in the CWSA where it will remain until an approved off-Site TSDF becomes available for treating the waste. The HEPA filters used during the ARA-16 remedial action are currently being stored. They may be used by another project. If not, they will be disposed appropriately. All other solid wastes were encapsulated in concrete and shipped to the SSA for eventual disposal in the ICDF. Other waste streams included unused/unaltered samples, analytical residues, and sample containers. Some unused/unaltered samples and analytical residues were returned from the laboratory to the project for disposal. The unused/unaltered samples were removed from the container and returned to the parent waste stream. The containers were combined with other debris for encapsulation. Any altered samples and the analytical residues returned to the project are being stored in the CERCLA storage unit awaiting treatment and disposal at an available off-Site TSDF. All other unused/unaltered samples, analytical residues, and sample containers were disposed of by the analytical laboratory.

5.3.6 ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2

Waste generated during the closure of the ARA-21 septic system included water removed from the tanks, which was disposed at the CFA Sewage Treatment Plant. Metal manholes, connecting piping, and lids removed from the two tanks were disposed of at the CFA landfill. A minimal quantity of PPE and plastic sheeting was generated that was surveyed and disposed as noncontaminated waste at the CFA landfill. Other waste streams included unused/unaltered samples, analytical residues, and sample containers, which were disposed of by the analytical laboratory.

5.3.7 ARA-25: ARA-I Soils beneath the ARA-626 Hot Cells

Waste generated during the remediation of the ARA-25 soils and hot cell foundation included the soils removed from the area underlying the former ARA-626 hot cell site, concrete from the hot cell foundation walls, PPE, and plastic sheeting. This waste was disposed of at the RWMC. The hot cell roof that was overlying the hot cell site was field screened for radiological contamination using standard RadCon protocols. Finding none, the roof was disposed of at the CFA landfill. No other waste streams were generated during this activity.

6. PREFINAL AND FINAL INSPECTION

The prefinal inspection of the WAG 5 Phase I sites was conducted on October 2 and 3, 2001, in accordance with the prefinal inspection checklist. The project had most items 100% complete. The items not yet completed at the time of the prefinal inspection included the following:

- Shipment of the ARA-16 tank sludge and carbon filter for off-Site treatment and disposal
- Shipment of the encapsulated ARA-16 tank to the SSA for eventual disposal in the ICDF
- Final survey and backfilling of the ARA-16 excavation
- Shipment of the ARA-13 distribution box (TSCA-regulated [for PCBs]) sludge off-Site for disposal
- Shipment of the ARA-02 debris and lead rings off-Site for disposal
- Shipment of the ARA-16 samples off-Site for treatment and disposal
- Decontamination of equipment
- Demobilization of the ARA-16 tank site
- Reseeding of disturbed areas, where necessary
- Completion of the annual inspection of the institutional control sites
- Analysis of the ARA-16 carbon filter samples.

Progress was accepted as satisfactory by the Agencies in attendance.

The annual institutional control status report serves as the official vehicle by which the Agencies will be kept apprised of the current status of the waste in the CERCLA storage unit. In addition, the Agencies will be kept informed of the progress and expected completion dates through conference calls. The Agencies have the latitude to inspect the sites and review progress at their discretion. The prefinal inspection checklist is included in Appendix D. The final inspection checklist will be submitted to the Agencies upon completion of the above activities with the exception of the disposition of the ARA-16 sludge and samples, and the ARA-02 facility sludge from Septic Tank #2. These items will remain in storage at the CWSA located at the ARA-I facility.

7. SUMMARY AND VERIFICATION OF WORK PERFORMED

The primary work activities for the OU 5-12 Phase I remedial action included:

- Removing inactive septic and waste system piping, tanks, and below-grade structures (as necessary)
- Removing contaminated soil and debris
- Packaging, shipping, and transporting remedial action waste
- Verifying that the soils remaining in place and stockpiled soils used for backfill did not contain contamination in excess of the remedial action goals
- Backfilling and re-contouring the excavated areas
- Reseeding and/or stabilizing disturbed areas.

7.1 Summary of Work Performed

With the exception of those items outlined in Section 6, the OU 5-12 Phase I remedial action has been completed in accordance with the WAG 5 RD/RA Work Plan, Phase I (DOE-ID 2001). The Phase I remedial action included the following:

- ARA-02—The ARA-02 piping was removed, sized, packaged, and shipped to Envirocare for disposal. The three manholes, three septic tanks, the seepage pit pumice blocks and gravel, and seepage pit sludge were also packaged and sent to Envirocare for disposal. Excavations were screened for radiological and VOC contamination and backfilled appropriately.

- ARA-07—The roof structure and top two courses of cement blocks were removed and disposed. In accordance with IDAPA regulations (IDAPA 58.01.03.007), the seepage pit was filled with earthen material and abandoned.

- ARA-08—The concrete slab covering the seepage pit was removed and disposed. In accordance with IDAPA regulations (IDAPA 58.01.03.007), the seepage pit was filled with earthen material and abandoned.

- ARA-13—The manhole, top sections of the three septic tanks, and the lid to the distribution box were removed and disposed. The water was removed separating it from the sludge and disposed at the CFA Sewage Treatment Plant. The sludge from the manhole and septic tanks was removed, stabilized, and disposed at the RWMC, while the TSCA-regulated sludge from the distribution box was dispositioned at Envirocare. In accordance with IDAPA regulations (IDAPA 58.01.03.007), holes were placed in the bottoms of the septic system components that were to remain in place. These components were then filled with earthen material and abandoned in place.

- ARA-16—The piping was removed, sized, and encapsulated for shipment to the SSA and eventual disposal at the ICDF. The tank waste was pumped into a dewatering HIC from which the water was separated from the sludge. The water was pumped through a carbon filter into 208-L (55-gal) drums in which it was stabilized for shipment to the SSA and eventual disposal in the ICDF. The sludge in the HIC was placed into compliant storage until an approved treatment facility becomes available. The tank was crushed to reduce the volume, filled with grout, encapsulated in concrete, and shipped to the SSA awaiting disposal in the ICDF. The tank vault and gravel were packaged and shipped to the RWMC. All excavations were field screened for radiological and organic contamination. Contaminated soil was sampled and analyzed (refer to Appendix C, page C-12) to determine the waste disposition path and disposed appropriately at the RWMC. All excavations were backfilled, contoured to grade, and will be reseeded or otherwise stabilized.

- ARA-21—The liquid waste in the septic tank and chlorine contact tank was removed and disposed at the CFA Sewage Treatment Plant. The manholes, connecting piping, and tank lids were disposed at the CFA landfill. In accordance with IDAPA regulations (IDAPA 58.01.03.007), holes were placed in the bottoms of each tank and the tanks filled with earthen material and abandoned in place.

- ARA-25—The radiologically contaminated foundation and associated soils were removed, packaged, and disposed at the RWMC. Basalt was reached and elevated levels of Cs-137 were still present. In accordance with the ROD and upon verbal concurrence of the Agencies, the excavation was backfilled with earthen material as the intent of the ROD had been met.

7.2 Verification of Work Performed

Verification of the work performed was documented throughout the duration of the project. The field team leader and job site supervisor maintained a daily logbook that detailed each day's work activities, including prejob briefings, number and names of personnel on the job site, and their functions. Copies of the daily logbooks can be obtained from the project files and on the INEEL Intranet through the INEEL Optical Imaging System. Periodic management assessments were conducted during the remedial action to verify that work was being completed in accordance with the WAG 5 RD/RA Work Plan, Phase I (DOE-ID 2001) and on schedule.

A prefinal inspection of the Phase I sites was conducted with the Agencies on October 2 and 3, 2001, to verify that the work outlined in the WAG 5 Work Plan for Phase I activities (DOE-ID 2001) was accomplished. Results of this inspection are documented in the checklist presented in Appendix D.

As-built drawings were prepared depicting the final remedial actions at the ARA-07, ARA-08, ARA-13, ARA-16, ARA-21, and ARA-25 sites. The drawings are provided in Appendix A. Table 7-1 summarizes the remediation goals for ARA-02, ARA-16, and ARA-25 and the final results of the remedial action.

7.3 Performance Standards and Construction Quality Control

The following subsections discuss the performance standards and construction quality control for each of the three Phase I sites requiring remediation under the ROD (DOE-ID 2000a). To ensure the quality control of in situ measurements, established standard operating procedures were followed that include calibration and verification requirements for the instruments used. Samples collected and sent to a laboratory were analyzed following standard analytical methods that include requirements for calibration and verification.

Table 7-1. Remediation summary.

Site	Remedial Action Objective	Remedial Action Results
ARA-02	RAOs established apply to the ARA-02 seepage pit sludge. Remediation goals summarized in Table 1-1 apply to this sludge.	The entire ARA-02 septic system, including the seepage pit sludge, has been removed. With the removal of the sludge, the main cleanup objective for the site has been achieved. Results of field screening analyses demonstrate that no contamination attributable to the septic system has leaked to the environment. Hence, the RAOs have been met.
ARA-16	The principal threat at the ARA-16 site is the waste contained in the tank. No releases had occurred from the tank nor was there evidence of the tank having leaked. The RAO developed for the site was removal of Cs-137 contamination in the soils and gravel below 23 pCi/g to inhibit direct exposure resulting in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and for future residents.	The waste in the tank, the tank itself, and all associated piping has been removed. The gravel and soil surrounding the tank have been removed. In situ gamma surveys of the area demonstrate that Cs-137 concentrations are below the remediation goal of 23 pCi/g. Hence, the RAOs have been met.
ARA-25	RAOs were developed to be protective of human health and the environment. To that end, remediation goals summarized in Table 1-2 can be satisfied by either cleaning up to the identified contaminant concentration or by removing all soil down to the basalt interface.	The concrete foundation, soils within the foundation, and soils immediately surrounding the ARA-25 hot cells have been removed. Excavation continued up to and included top layers of the basalt interface. In situ gamma measurements demonstrated that elevated levels of Cs-137 contamination still exist at the site. In accordance with the ROD (DOE-ID 2000a), the RAOs will be considered satisfied if all soil has been removed down to the basalt interface. Although, contamination is still present at the site, given that excavation has gone into the basalt interface, the RAOs have been met.

7.3.1 ARA-02 Sanitary Waste System

For ARA-02, the entire septic system was removed in accordance with the requirements of the ROD (DOE-ID 2000a). The seepage pit sludge was removed and disposed, thus mitigating the human health risk associated with this site. In situ measurement of the soils immediately underlying the seepage pit location demonstrated that the Cs-137 concentration remaining in the soil was 0.36 ± 0.13 pCi/g, which is below the remediation goal of 8.5 pCi/g at the 1E-04 human health risk concentration for the residential 100-year scenario decayed through the exposure period. It is also below the average Cs-137 concentration of 0.82 pCi/g for the INEEL at the 95% upper confidence limit for the mean soil concentration averaged over a 3-m (10-ft) soil interval (Rood, Harris, and White 1996). Using Cs-137 as a marker and assuming the concentrations of the other contaminants of concern are present at the same ratio as the maximum concentrations provided in Table 21 of the ROD (DOE-ID 2000a), the concentrations of the remaining contaminants were derived as provided in Table 7-2. Based upon comparison of the post-remediation concentrations to the remediation goals, the remediation of the ARA-02 site is determined to be successful.

7.3.2 ARA-16 Radionuclide Tank

For ARA-16, the waste was removed from the tank, the tank as well as all associated piping, and the concrete vault was removed in accordance with the requirements of the ROD (DOE-ID 2000a). In situ measurement of the basalt/soils underlying the tank and vault demonstrated that the maximum Cs-137 concentration remaining was 1.5 pCi/g, which is below the remediation goal of 23 pCi/g at the 1E-04 human health risk concentration for the residential 100-year scenario decayed through the exposure period. Because the remaining contaminant concentration is below the remediation goal, the remediation of the ARA-16 site is determined to be successful.

7.3.3 ARA-25 Contaminated Soils

For ARA-25, the contaminated soils were removed in accordance with the requirements of the ROD (DOE-ID 2000a). In addition, the hot cell foundation was also removed allowing excavation of the underlying and immediately surrounding soils to basalt. In situ measurement of the basalt layer demonstrated that the maximum Cs-137 concentration remaining was 398 pCi/g, which exceeds the remediation goal of 23 pCi/g at the 1E-04 human health risk concentration for the residential 100-year scenario decayed through the exposure period. As with the ARA-02 site, the Cs-137 was used as a marker to calculate the concentrations of the remaining contaminants based upon the ratio of their maximum concentrations to that of Cs-137, as obtained from Tables 13 and 14 in the ROD (DOE-ID 2000a). The concentration of Cs-137 and those derived for the other contaminants of concern are provided in Table 7-3. Although the remaining contaminant concentrations exceed the remediation goal, it was stipulated in Section 8.6 of the ROD (DOE-ID 2000a) that remediation goals can be satisfied by either cleaning up to the identified contaminant concentration or by removing all soil down to the basalt interface. Because the contaminated soils were removed down to the basalt interface, the remediation of the ARA-25 site is determined to be successful.

Table 7-2. ARA-02 contaminant concentrations.

Contaminant of Concern	Maximum Concentration prior to Remediation	Remediation Goal	Post-Remediation Concentration
Cs-137	178 pCi/g	8.5 pCi/g	0.36 pCi/g
Ra-226	89.6 pCi/g	1.2 or 2.1 pCi/g[a]	0.18 pCi/g
U-235	120 pCi/g	6.2 pCi/g	0.24 pCi/g
U-238	190 pCi/g	10.6 pCi/g	0.38 pCi/g
Aroclor-1242	23.5 mg/kg	1 mg/kg	0.05 mg/kg
Lead	1,290 mg/kg	400 mg/kg	2.61 mg/kg

a. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235; otherwise, a goal of 1.2 pCi/g will be used. Since U-235 is present at this site, the use of the 2.1 pCi/g remediation goal would be appropriate even though the post-remediation concentration is well below either of the two Ra-226 remediation goal concentrations.

Table 7-3. ARA-25 contaminant concentrations.

Contaminant of Concern	Maximum Concentration prior to Remediation	Remediation Goal	Maximum Post-Remediation Concentration
Cs-137	449 pCi/g	23 pCi/g	398 pCi/g
Ra-226	29.7 pCi/g	1.2 or 2.1 pCi/g[a]	26.3 pCi/g
Arsenic	40.6 mg/kg	5.8 mg/kg	36.0 mg/kg
Lead	1,430 mg/kg	400 mg/kg	1,266 mg/kg
Copper	227 mg/kg	220 mg/kg	201 mg/kg

a. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235; otherwise, a goal of 1.2 pCi/g will be used. Regardless of which remediation goal concentration is used for comparison, the post-remediation concentration clearly exceeds either one.

7.4 Institutional Controls

The following subsections discuss the institutional control requirements for each of the three Phase I sites requiring remediation under the ROD (DOE-ID 2000a). In addition, institutional controls are discussed regarding the four sites that were closed as part of the Phase I activities.

7.4.1 ARA-02 Sanitary Waste System

As per the ROD (DOE-ID 2000a), institutional controls will not be required at ARA-02 following remediation if all contaminated sludge is removed to basalt or if contaminant concentrations are comparable to local background values for soil. The remedial action was successful in removing all the contaminated sludge. Furthermore, the post-remediation concentrations of the contaminants of concern are below the remediation goal for the site. For the radionuclide contaminants, the remediation goal concentrations that are based on the 100-year scenario must be adjusted for decay to current day. Table 7-4 provides a comparison of the remediation goal concentrations adjusted for decay to existing concentrations of the radionuclide contaminants of concern.

Based upon the post-remediation concentrations of the contaminants of concern being below both the remediation goals as well as the decay-corrected remediation goals, institutional controls at the ARA-02 site are not required. There exist areas of surficial soil contamination where the concentrations of Cs-137 are elevated. This contamination is attributed to ARA-23 and will be addressed under Phase II remedial activities.

7.4.2 ARA-16 Radionuclide Tank

For ARA-16, the concentration of Cs-137 remaining in the soils at the basalt interface underlying the tank had a maximum concentration of 1.5 pCi/g. This is below the remediation goal of 23 pCi/g that equates to a current concentration of 2.3 pCi/g for Cs-137. Although it exceeds the background concentration of 0.82 pCi/g, the requirement has been met to remove soils to the basalt. Given that fact along with the remaining contamination being below the calculated current risk-based concentration (2.3 ρCi/g), institutional controls at the ARA-16 site are not required. As with ARA-02, Cs-137 is present in surficial soils attributed to windblown contamination as a result of the SL-1 accident. These soils will be addressed as part of the Phase II remedial action for ARA-23 following the need for which institutional controls will be addressed.

Table 7-4. ARA-02 decay-corrected remediation goals.

Contaminant of Concern	Remediation Goal	Decay-Corrected Remediation Goal	Post-Remediation Concentration
Cs-137	8.5 pCi/g	0.85 pCi/g	0.36 pCi/g
Ra-226	1.2 or 2.1 pCi/g	1.15 or 2.01 pCi/g[a]	0.18 pCi/g
U-235	6.2 pCi/g	6.2 pCi/g	0.24 pCi/g
U-238	10.6 pCi/g	10.6 pCi/g	0.38 pCi/g

a. A goal of 2.1 pCi/g will be used for comparison of sample results that may include interference from U-235; otherwise, a goal of 1.2 pCi/g will be used. Since U-235 is present at this site, the use of the 2.1-pCi/g remediation goal would be appropriate even though the post-remediation concentration is well below either of the two Ra-226 remediation goal concentrations.

7.4.3 ARA-25 Contaminated Soils

For ARA-25, soils were removed to the basalt. However, the concentrations of most of the contaminants of concern were elevated above the remediation goals, as well as the risk-based concentrations. Although the ROD (DOE-ID 2000a) requirement has been met in terms of removal of contaminated soils, contamination remains at the basalt interface. As such, institutional controls at the ARA-25 site will be required. As outlined in Table 3-2 of the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000d), institutional controls at the ARA-25 site will consist of the following:

- Visible access restrictions—CERCLA sign
- Prevention of unauthorized access—INEEL security gate.

In addition, a monument will be installed marking the location of subsurface contamination remaining at the site.

7.4.4 Closure Sites

In accordance with the ROD (DOE-ID 2000a), institutional controls would not be required at any of the four sites that were closed during the Phase I activities (i.e., ARA-07, ARA-08, ARA-13, and ARA-21). Based upon results of the closure activities and information presented in the *Waste Area Group 5, Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999), no evidence exists that would indicate institutional controls at any of these sites are warranted.

Based upon the analytical data obtained for ARA-13 and ARA-21 during Phase I, this determination holds true for these sites. However, based upon historical analytical data for the ARA-07 and ARA-08 sites, residual Cs-137 contamination exists that warrants institutional controls being established at these two sites. For ARA-07 and ARA-08, the historical Cs-137 maximum concentrations were 17.6 pCi/g and 11.6 pCi/g, respectively. These analyses were performed in June 1991, thus the decay-corrected Cs-137 concentrations for ARA-07 and ARA-08 are 13.8 pCi/g and 9.1 pCi/g, respectively. These concentrations exceed the current concentration of 2.3 pCi/g required for free release; therefore, institutional controls will be required. The institutional controls will consist of visible access restrictions (i.e., CERCLA signs) and prevention of unauthorized access (i.e., the INEEL security gate). The requirement for institutional controls at these two sites will be reviewed every five years.

8. CERTIFICATION THAT REMEDY IS OPERATIONAL AND FUNCTIONAL

As stated in the ROD (DOE-ID 2000a), the remedial action objectives and the remedial action goals were established to reduce or eliminate the risk to human health and the environment. To ensure current or future exposure to human health and the environment does not exceed the RAOs, access restrictions and institutional controls will be established for the ARA-02, ARA-16, and ARA-25 sites as per the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000d). In addition, the plan will be revised to include institutional controls for ARA-07 and ARA-08, as discussed in Section 7.4.4.

This report certifies that the remedies selected in the OU 5-12 ROD (DOE-ID 2000a) and detailed in the WAG 5 RD/RA Work Plan, Phase I (DOE-ID 2001) have been completed, and the remedies are operational and functional. Institutional controls and operations and maintenance of the remedial action sites will be implemented as outlined in the *Operations and Maintenance Plan for Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000d) to ensure that the remedies remain protective of human health and the environment.

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